Leak Monitoring Systems
for double-walled piping
Technical details
# Leak monitoring systems

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Leak monitoring für double-walled piping

System description

The leak monitoring

Double-walled piping is permanently monitored using pneumatic leak detecting devices. These regulate the monitoring pressure in the surveillance space and register any changes of pressure which may occur. The surveillance space prevents uncontrolled spillages of the transport medium when leaks occur. The surveillance space must be so constructed that the functioning and operative security of the leak monitoring system (the leak detector) is assured at all times. The size if the surveillance space for each leak detector is limited to 10 m³ acc. to DIN EN 13160.

If the pipe is damaged the alarm is given by acoustic and optical signals.

Definition of leak detection equipment/leak detector

“Leak detection equipment/leak detector” according to the currently valid regulations refers to a device which automatically and under all operating conditions gives warning of leaks in the walls of double-walled piping in which water hazardous (flammable and non-flammable) fluids are transported. The term “leak detection equipment/leak detector” includes all the equipment necessary for the detection of leaks.

The main components are:
- the leak detector/leak monitoring equipment
- the connection between the surveillance space and leak detector
- double-walled piping: FLEXWELL® Safety Pipe
  BRUGG-STAMANT® Safety Pipe
  SECON®-X Petrol station pipe
- the surveillance space
- a leak detection medium

The use of this system complies with the most stringent European safety standards (Class 1). Systems of this class give warning of a leak above or below the fluid level in a double-walled protective system. They are constructed on the principles of absolute safety and ensure that spillages of products into the environment cannot occur.

Leak detector

We distinguish two types of differential pressure leak detection equipment: Leak surveillance to detect leaks in double-walled piping on the vacuum principle and on the positive pressure principle.

Approval/suitability

All leak detection equipment/leak detectors in use must comply with the basic criteria laid down for construction and testing standards. All such preconditions which could have a bearing on the functional and operative safety of the system must therefore be observed.

It therefore goes without saying that the conditions for operative use have been tested by the competent authorities and clearly defined and set down in the documents of approval issued by them.

Double-walled piping with leak monitoring is an approved leak detection equipment/leak detector system.

The advantages of the system

Using double-walled FLEXWELL® Safety Pipe with leak monitoring offers, besides a high degree of operative safety, substantial economic advantages:
- the entire system can be easily and simply monitored at any time without interrupting operations
- requirements such as e.g. pressure/volume measurements, pressure tests or route surveys can be dispensed with
- when a leak occurs, operations can normally be continued without interruption; repairs can be planned.
- remote monitoring (LOD) of all operating parameters is possible (24/7).
Leak monitoring für double-walled piping

Overview of leak detectors

<table>
<thead>
<tr>
<th>Type of leak detector</th>
<th>VLR 410/E</th>
<th>VLX 330/A-Ex</th>
<th>DLR-G ...</th>
<th>DLR-P ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLEXWELL® Safety Pipe</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>BRUGG-STAMANT® Safety Pipe</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>–</td>
</tr>
<tr>
<td>SECON®-X Petrol Station Pipe</td>
<td>•</td>
<td>•</td>
<td>–</td>
<td>•</td>
</tr>
</tbody>
</table>

Area for installation

- Dry and frost-free area

Flashpoint of transport medium

- < 55 °C
- > 55 °C

Max. pipe length see Worksheets LDS 8.120, LDS 8.120, LDS 8.130, LDS 8.130

Max. operating pressure

- 25 bar
- 10 bar
- 22 bar
- 1 bar

Potential-free relay

Remote monitoring option LOD

Dimensions of housing (BxHxT) in mm

- 217x266x110
- 300x200x160
- 217x266x110
- 127x266x110

Dimensions detector unit

- 200x120x90

Additional criteria for selection

- Compact, uncomplicated leak detector for consumer heating oil plants
- Leak detector for flammable media with minimum maintenance
- Electronic leak detector for all pressure stages
- Reliable leak detector for petrol stations low operating pressu

Please note

- monitorable pipe lengths acc. to Worksheets LDS 8.120 and LDS 8.130
- observe the effective area as well as the Ex zones
- Queries refer to all the piping to be monitored and all media transported
- the permissible operating and surveillance space pressures of the various pipe systems must be considered

Monitorable pressures

<table>
<thead>
<tr>
<th>Type</th>
<th>vacuum leak monitoring</th>
<th>positive pressure leak monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>max. pressure inner pipe bar</td>
<td>max. pressure surveillance space bar</td>
</tr>
<tr>
<td>FLEXWELL® Safety Pipe (all sizes)</td>
<td>25</td>
<td>–0.7</td>
</tr>
<tr>
<td>SECON®-X 25</td>
<td>3.5</td>
<td>–0.7</td>
</tr>
<tr>
<td>SECON®-X 40</td>
<td>3.5</td>
<td>–0.7</td>
</tr>
<tr>
<td>SECON®-X 50</td>
<td>3.5</td>
<td>–0.7</td>
</tr>
<tr>
<td>SECON®-X 100</td>
<td>3.5</td>
<td>–0.7</td>
</tr>
<tr>
<td>BRUGG-STAMANT® Safety Pipe</td>
<td>acc. to project on request / References up to 400 °C and 250 bar</td>
<td></td>
</tr>
<tr>
<td>Special piping</td>
<td>acc. to project on request</td>
<td></td>
</tr>
</tbody>
</table>
Leak detector for double-walled piping

Leak monitoring Online Diagnosis LOD

According to VAUwS the operator of a plant with water-hazardous substances is obliged to provide evidence that the plant is leak-proof and to check the functioning of the safety precautions (leak detector) regularly. In order to optimise these function checks, BRUGG Rohrsysteme GmbH offers a remote monitoring system, LOD.

What is LOD?

Leak monitoring Online Diagnosis, LOD, is a system which for the first time realizes the safe and continuous remote monitoring of a leak detector. Each and every operating parameter is recorded around the clock (24/7), communicated automatically once every 24 hours by mobile telephony to the LOD server where it is analysed. That means that the correct operational functioning of the leak detector is checked every single day.

How does LOD work?

Any alarm is immediately communicated to the system when it occurs and leads directly and automatically to an email or text message being sent to the addresses you have supplied. All alarm messages received are registered by the LOD system, repeated at regular intervals and only deleted after the cause of the alarm has been rectified on site.

In this, LOD not only checks all functions of the leak detector but transmits the current pressure in the monitoring system as well as the leak status of the entire plant. This provides a hitherto unattained degree of certainty that the alarm signal will be relayed onwards and the necessary reaction ensured.

Technical details and installation of LOD

The leak detector comes equipped ex works with a pre-installed data transfer module (DTM) and a powerful externally visible rod aerial. The individual DTM is connected to the electronic system of the leak detector and logged in to the LOD via a serial number which identifies it clearly. For installations in areas which have a poor telephony signal, an aerial extension including an angled support is available.

Overview of the data transmitted

- daily report checking on the operation and functioning of the leak detector
- real-time status of pressure in the system; alarm signal if pressure drops
- leak tightness of the entire system consisting of the leak detector and the connected surveillance space
- frequency of pump runs and overall running time of pump for ordering service checks
- responsiveness check of internal sensor (probe or ZD)
- status of an additional digital sensor (if connected to DTM)
- output value of an additional analogue 4 – 20 mbar sensor (if connected to DTM), e.g. readout of residual pressure in gas bottles

Advantages of the system

- it is no longer possible to overlook alarm signals or ignore incoming alarms, alarm equipment can no longer be manipulated
- can also be used for installations in remote locations which are not easily accessible and are only seldom visited, for petrol stations without attendants, standby power supply systems
- safe from manipulation
- maximum possible operating safety
- maintenance checks can be optimally planned through automatic messages to identify service needs
- minimal plant downtime ensured

Availability of LOD

LOD is available in all three DACH countries (Germany, Austria, Switzerland/black coloured). Availability over the rest of Europe (grey coloured) is under preparation.
Maximum monitoring length

Double-walled piping with vacuum leak monitoring

Basis
ZG-LAGR principles of approval for leak monitoring equipment for double-walled piping

Determining the maximum monitorable pipe length
Half the alarm-triggering pressure loss „on“ in [mbar] of the leak detector used, with certificate of suitability for approval by the building authorities from the DIBt (Deutschen Institut für Bautechnik), divided by the pressure loss per metre in the surveillance space gives the maximal monitorable pipe length.

\[ L_{\text{max.}} = \frac{\text{alarm-triggering pressure loss „on“ [mbar]}}{2 \cdot \text{pressure loss [mbar/m]}} \]

Example
Type of laying single line
Alarm-triggering pressure loss „on“ 410 mbar
Half alarm-triggering pressure loss 205 mbar
Type of pipe FSR 60/83
max. monitorable pipe length \( L_{\text{max.}} \approx 460 \) m

Diagram for horizontal laying of double-walled piping FLEXWELL® Safety Pipe (FSR) and SECON®-X (SEC)
Maximum monitoring length

Double-walled piping with positive pressure leak monitoring

Basis
ZG-LAGR principles of approval for leak monitoring equipment for double-walled piping

Determining the maximum monitorable pipe length
Half the alarm-triggering pressure loss „on” in [mbar] of the leak detector used, with certificate of suitability for approval by the building authorities from the DIBt (Deutschen Institut für Bautechnik), divided by the pressure loss per metre in the surveillance space gives the maximal monitorable pipe length.

\[
L_{\text{max.}} = \frac{\text{differential pressure in surveillance space [mbar]}}{2 \cdot \text{pressure loss [mbar/m]}}
\]

Example

Type of laying | single line
---|---
Transport pressure in operating pipe | 5 bar
Monitoring pressure in surveillance space | 7 bar
Alarm-triggering pressure rise „on” | 6 bar
Differential pressure in the surveillance space | 1 bar
Alarm-triggering pressure rise „on” 6 bar gives | 1000 mbar differential pressure
Half alarm-triggering pressure rise | 500 mbar
Type of pipe | FSR 60/83
max. monitorable pipe length L\text{max.} | 1100 m

Diagram for horizontal laying of double-walled piping FLEXWELL\textsuperscript{	extregistered} Safety Pipe (FSR) and SECON\textsuperscript{®}-X (SEC)
Vacuum leak detector Type VLR 410/E

System description

Leak monitoring on the vacuum principle

The vacuum leak detector Type VLR is suitable and approved for the monitoring of double-walled piping used for transporting water-hazardous flammable substances with a flashpoint > 55 °C (e.g. heating oil, diesel fuel, water-glycol mixture, AD Blue, ...).

Versions

VLR 410/E: max. operating pressure in the inner pipe 25 bar (a leakage probe or a solenoid valve or both can be connected in addition).

Alarm-triggering values

VLR 410/E: on > 410 mbar

Functioning principle

The vacuum pump installed in the leak detector creates a partial vacuum in the surveillance space. This partial vacuum is measured by a pressure sensor. Through monitoring the vacuum, leaks are therefore automatically detected.

In the event of a drop in the partial vacuum below the lower value of the monitoring partial vacuum (pressure rise) due to a leak, an optical and acoustic alarm is triggered. Minimal, unavoidable permeability (not leaks) are regulated automatically by the leak detector without triggering the alarm if they lie between the upper and lower values of the monitoring partial vacuum. Subsequent evacuation is carried out by the vacuum pump in the leak detector.

In every case in which the alarm is triggered by the VLR410/E the vacuum pump is automatically switched off. It can only be switched on again by throwing the toggle switch “Operation”.

Technical basis

The scope of application of the leak detection device must be limited to fixed maximum pipe lengths due to the laws of physics. These depend on upper and lower points of reference and on the type of lying of the double-walled safety piping. The types of laying are illustrated in the Worksheets LDS 8.214 ff.

Tips for installation

The leak detector may not be installed in areas where there is a danger of explosions. Wherever possible, the leak detector should be mounted inside an enclosed dry room. If it is installed outside enclosed rooms, the leak detector must be mounted in a weatherproof metal housing.

Installation/commencement of operations/operation/function testing

Detailed descriptions can be seen from the approval documentation of the VLR leak detector. The conditions set out in the approval for double-walled piping and the VLR leak detector must be complied with.
Vacuum leak detector Type VLR 410/E

Technical data

**Overview leak detector Type VLR 410/E**

<table>
<thead>
<tr>
<th>Applications</th>
<th>water-hazardous fluids with a flashpoint &gt; 55 °C, without the occurrence of explosive vapour-air mixtures. From flashpoint &lt; 55 °C: VLX... in Ex version</th>
</tr>
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<td>Monitorable pipe length</td>
<td>L max = max. monitorable pipe length acc. to laying procedure (see Worksheet LDS 8.120, for underground and surface-laid pipes.)</td>
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<tr>
<td>Operating pressure</td>
<td>up to max. 25 bar VLR 410/E (with operating pressure from 5 bar a solenoid valve must be used)</td>
</tr>
<tr>
<td>Installation area</td>
<td>wherever possible, install inside an enclosed, dry room with no access for unauthorized personnel. Installation in the open inside a suitable metal housing and not in areas where there is a danger of explosions.</td>
</tr>
<tr>
<td>Installation in the open/ in damp rooms</td>
<td>inside a suitable metal housing, depending on the requirements – optical and acoustic signal</td>
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<tr>
<td>Housing dimensions</td>
<td>Height: 210 mm, width: 265 mm, depth: 110 mm</td>
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<td>Fittings</td>
<td>Insulating piece with flanged screw connection to separate the metal connection in earthed installations acc. to TRbF 521.</td>
</tr>
<tr>
<td>Electrical data</td>
<td>Rated input (without external signal) 230 V~ – 50 Hz – 50 W</td>
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<td></td>
<td>Switching contact load, connector block AS (5 and 6) 230 V~ – 50 Hz – 200 VA</td>
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<tr>
<td></td>
<td>Switching contact load, potential-free contacts, connector block 11 to 12 max. 230 V~ – 50 Hz – 5 A min. 6 V/10 mA</td>
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<td></td>
<td>External fuse protection of the leak detector max. 10 A</td>
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<td></td>
<td>Overvoltage category 2</td>
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Subject to technical changes.
Vacuum leak detector Type VLR 410/E

Construction

Suction pipe and measuring lead of the leak detectors are connected by means of a screwed T-piece (crosspoint KP) and connected to the connection fitting AV by a measuring branch MA.

When several double-walled piping lines are connected, the individual surveillance spaces are directly connected via the distributor block or switched in-line. The suction pipe is connected at the front, the measuring lead at the end of the series. The surveillance spaces of the piping lines are connected together. All connection and connection fittings are connected to the connection fitting AV by means of a measuring branch MA.
Vacuum leak detector Type VLR 410/E

Laying in a single line up to max. 25 bar

Connecting the leak detector to the surveillance space
Of the double-walled safety pipe (Worksheet LDS 8.213)

A test valve must be installed at the far end of the pipe. The low point(s) must not exceed a depth of 3.5 m. The piping can have further high or low points as long as the sum of the high and low points does not exceed 3.5 m.

MA  Measuring branch
AV  connection fitting
PV  test valve
KP  cross point
PB  transport pressure in inner pipe
MV  solenoid valve
FL  fluid barrier

At a PB > 5 bar up to max. 25 bar a solenoid valve MV must be installed between the crosspoint KP and the measuring branch MA.

The solenoid valve protects the leak detector from non-permissible high pressures. The solenoid valve is monitored electronically so that a failure of the solenoid valve triggers the alarm.
Leak monitoring systems

Vacuum leak detector Type VLR 410/E

Laying in one line up to max. 25 bar with additional measuring unit ZD 410

If the maximum monitorable length acc. to Worksheet LDS 8.120 is not sufficient for an individual case the additional measuring unit ZD 410 must be installed.

Connecting the leak detector to the surveillance space of the double-walled safety pipe (Worksheet LDS 8.213)

The leak detector is connected as shown in the illustration in Worksheet LDS 8.213. An additional measuring unit Type ZD 410 is installed at the other end of the pipe using the same connection method. The additional measuring unit Type ZD 410 is electrically connected to the leak detector VLR10/E.

MA Measuring branch
A connection fitting
KP crosspoint
FL fluid barrier
PD three-way stopcock

ZD 410 additional measuring unit
PB transport pressure in inner pipe
MV solenoid valve
SL electric control lead type NYY 3 x 1,5²

At a PB > 5 bar up to max. 25 bar a solenoid valve MV must be installed between the crosspoint KP and the measuring branch MA.

The solenoid valve protects the leak detector from non-permissible high pressures. The solenoid valve is monitored electronically so that a failure of the solenoid valve triggers the alarm.
Vacuum leak detector Type VLR 410/E
Laying in two or multiple lines up to max. 25 bar

Connecting the leak detector to the surveillance space
of the double-walled safety pipe (Worksheet LDS 8.213)

The geodetic difference in height between the lowest point of the piping and the leak detector must not exceed 3.5 m. The depth of 3.5 m is the limiting line between the “highest” and “lowest” low points.

At a PB > 5 bar up to max. 25 bar a solenoid valve MV 115 V must be installed in both the suction pipe and the measuring lead.

The solenoid valves protect the leak detector from non-permissible high pressures. The solenoid valves are monitored electronically so that a failure of a solenoid valve triggers the alarm.
Vacuum leak detector Type VLR 410/E

Laying in multiple lines with distributor block up to max. 25 bar

Connection of the leak detector to the distributor block
(Worksheet LDS 8.213)

The individual surveillance spaces of the double-walled piping lines are connected using the measuring branch MA to the outlets of the distributor block. When laying in multiple lines, the double-walled piping may have high and low points as described in Worksheet LDS 8.214 for laying in a single line, as long as the sum of the high and low points does not exceed 3.5 m.

At PB > 5 bar up to max. 25 bar a solenoid valve MV must be installed between the crosspoint KP and the connection to the distributor block VT.

The solenoid valve protects the leak detector from non-permissible high pressures. The solenoid valve is monitored electronically so that a failure of the solenoid valve triggers the alarm.
Vacuum leak detector Type VLX 330/A-Ex
System description, technical data

Type VLX 330/A-Ex, version with partial protection from explosions

The vacuum leak detector Type VLX 330/A-Ex is suitable and approved for monitoring double-walled safety piping through which the following fluids are transported:

- Flashpoint < 55 °C
- Water-hazardous, flammable fluids with a possible occurrence of potentially explosive vapour-air mixtures assignable to explosion categories IIA or IIB3 and temperature category T1 to T3 (e.g., petrol, motor fuels in general, ...)

Double-walled components may be integrated into the piping. Approved for a max. operating pressure in the operational pipe
- Type VLX 330/A-Ex ... up to max. 10 bar
- Type VLX 330/A-MV-Ex up to max. 25 bar

Installation/commencement of operations/operation/function testing

The scope of application of the leak detection device must be limited to fixed maximum pipe lengths due to the laws of physics. These depend on upper and lower points of reference and on the type of laying of the double-walled safety piping. The types of laying are illustrated in the Worksheets LDS 8.233 ff.

The conditions set out in the approval for double-walled piping and for the leak detector must be complied with.

Overview of leak detector VLX 330/A-Ex

| Applications | Water-hazardous fluids with a flashpoint < 55 °C, with a possible occurrence of potentially explosive vapour-air mixtures assignable to explosion categories IIA or IIB3 and temperature category T1 to T3 (e.g., petrol, motor fuels in general, ...)
| Operating pressure in inner pipe | Type VLX 330/A-Ex: | max. 10 bar
| | Type VLX 330/A-MV-Ex: | max. 25 bar
| Monitorable pipe length | L_max = monitorable pipe length acc. to Worksheet LDS 8.120 for underground and surface-laid pipes
| Installation area | acc. to installation instructions and description of leak detector VLX 330/A-Ex
| Installation | see description of leak detectors VLX 330/Ex and VLX 330/A-Ex
| Housing | VLX 330/A-Ex comprises a control unit and the working device
| Fittings | fittings set out in the programme for the leak detector and the double-walled piping
| Electrical data | Rated input (without external signal) 230 V~ – 50 Hz – 50 W
| | Switching contact load, potential-free contacts max. 230 V~ – 50 Hz – 5 A
| | Connector block 21 - 24 min. 6 V/10 mA
| | External fuse protection of the leak detector max. 10 A
| | Overvoltage category 2

On request, Type VLX 330/Ex can be delivered in a completely explosion-protected version.
Vacuum leak detector Type VLX 330/A-Ex

Construction vacuum leak detector Type VLX 330/A-Ex
Article No. 829 423 98

<table>
<thead>
<tr>
<th>BV</th>
<th>screwed flange connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>GD</td>
<td>three-way stopcock measuring lead/suction pipe</td>
</tr>
<tr>
<td>DS</td>
<td>detonation protection</td>
</tr>
<tr>
<td>FL</td>
<td>fluid barrier</td>
</tr>
<tr>
<td>DG</td>
<td>pressure compensating vessel</td>
</tr>
</tbody>
</table>

Construction vacuum leak detector Type VLX 330/A-MV-Ex
(available on request)

In the Type VLX 330/A-MV-Ex an additional solenoid valve is integrated into the leak detector.

If the working device is used in a „Non-Ex area“, the exhaust tube must be relocated to an Ex area of Zone I.

Construction vacuum leak detector Type VLX 330/Ex
Article No. 829 424 10
(available on request)

<table>
<thead>
<tr>
<th>BV</th>
<th>screwed flange connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>GD</td>
<td>three-way stopcock measuring lead/suction pipe</td>
</tr>
<tr>
<td>DS</td>
<td>detonation protection</td>
</tr>
<tr>
<td>FL</td>
<td>fluid barrier</td>
</tr>
<tr>
<td>KP</td>
<td>crosspoint</td>
</tr>
<tr>
<td>DG</td>
<td>pressure compensating vessel</td>
</tr>
</tbody>
</table>
Vacuum leak detector Type VLX 330/A-Ex

Laying in one line up to max. 10 bar

Connecting the leak detector to the surveillance space of the double-walled piping (Worksheet LDS 8.232)

A test valve must be installed at the far end of the pipe. The low point(s) must not exceed a depth of 3.5 m. The piping can have further high or low points as long as the sum of the high and low points does not exceed 3.5 m.

MA  measuring branch
DS  detonation protection (only if Ex danger)
AV  connection fitting
PV  test valve
KP  crosspoint
Vacuum leak detector Type VLX 330/A-Ex

Laying in two or multiple lines up to max. 10 bar

The geodetic difference in height between the lowest point of the piping and the leak detector must not exceed 3.5 m. The depth of 3.5 m is the limiting line between the “highest” and “lowest” low points.

MA measuring branch
DS detonation protection
AV connection fitting
BV ventiliation valve
GD three-way stopcock
FL fluid barrier

Max. monitorable pipe length L max.
Sum of all ind. lengths for FLEXWELL®
Safety Pipe – all types: up to 500 m
At a maximum pipe length > 500 m see Worksheet LDS 8.120
Vacuum leak detector Type VLX 330/A-Ex

Laying in multiple lines with distributor block up to max. 10 bar

The individual surveillance spaces of the double-walled piping lines are connected using the measuring branch MA to the outlets of the distributor block. When laying in multiple lines, the double-walled piping may have high and low points as described in Worksheet LDS 8.233 for laying in a single line, as long as the sum of the high and low points does not exceed 3.5 m.

MA  measuring branch
DS  detonation protection (only if Ex danger)
AV  connection fitting
PV  test valve
VT  distributor block
FL  fluid barrier connected against the reverse direction
Positive pressure leak detector Type DLR-G ...

System description

The positive pressure leak detector Type: DLR-G... is suitable as per approval for monitoring double-walled piping through which water-hazardous fluids with a flashpoint below and above 55 °C is transported.

Functioning principles

The necessary pressure in the surveillance space of the double-walled piping depends on the actual operating pressure in the medium pipe (inner pipe) and is generated
- by topping up regulated by pressure changes from a stationary nitrogen pressure reservoir connected continuously to the surveillance space: Operating Mode S(tationary)
- from a mobile pressure reservoir which is only connected when the line is put into operation or during a function test: Operating Mode M(obile)

Operating modes S and M can be chosen by adjusting the switch on the board in the leak detector.

The surveillance space is connected with the leak detector by means of the connecting leads. The pressure which builds up is measured by the pressure sensor. If pressure drops to the value set previously for ALARM-ON due to a leak, the optical and acoustic alarm will be triggered.

In operating mode S the monitoring pressure is regulated after putting the system into operation by pressure changes which top up from a stationary nitrogen pressure reservoir which is continuously connected with the surveillance space and equipped with a pressure reducing valve.

In operating mode M the monitoring pressure (TOP-UP OFF) is set just once when the system is put into operation by a pressure reservoir which is not continuously connected. There is no top-up regulated by pressure changes in subsequent operation. Any drop in pressure which reaches the ALARM ON point and triggers the alarm must then be compensated by connecting the pressure reservoir till the previously set TOP-UP OFF level is reached.

The manufacturer of the leak detector stipulates that the leak detector must be undergo a maintenance check once a year on a recurring basis by an expert firm accredited according to WHG in order to ensure correct functioning and operating safety.

Switching pressures see Table 1 in Worksheet LDS 8.301.

Technical basis

The scope of application of the leak monitoring system is limited by maximum piping lengths. The alarm is triggered by the leak detector at the latest when a pressure which is at least 1.0 bar over the maximum transport pressure of the medium pipe (inner pipe) is reached (see Table 1). The types of laying are illustrated in Worksheets LDS 8.304 and LDS 8.305.

Tips for installation

The leak detector may not be installed in areas where there is a danger of explosions. Wherever possible, the leak detector should be mounted inside an enclosed dry room. If it is installed outside enclosed rooms, the leak detector must be mounted in a weatherproof metal housing.

Installation/commencement of operations/operation/function testing

Detailed descriptions can be seen from the approval documentation of the DLR-G ... leak detector and the Worksheets for the FLEXWELL® piping. The conditions set out in the approval for the double-walled piping and the DLR-G ... leak detector must be complied with.
Positive pressure leak detector Type DLR-G ...

Switching pressures

<table>
<thead>
<tr>
<th>Type DLR-G</th>
<th>( P_a )</th>
<th>( P_{AE} )</th>
<th>( P_{AA} )</th>
<th>( P_{UDV1} )</th>
<th>( P_{PRÜF} )</th>
<th>( P_{DM} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pressure 0</td>
<td>&gt; 1</td>
<td>&lt; 2</td>
<td>9.0 ± 0.5</td>
<td>&gt; 3.4</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>&lt; 1</td>
<td>&gt; 2</td>
<td>&lt; 3</td>
<td>9.0 ± 0.5</td>
<td>&gt; 4.5</td>
<td>3.5</td>
</tr>
<tr>
<td>3</td>
<td>&lt; 2</td>
<td>&gt; 3</td>
<td>&lt; 4</td>
<td>9.0 ± 0.5</td>
<td>&gt; 5.6</td>
<td>4.5</td>
</tr>
<tr>
<td>4</td>
<td>&lt; 3</td>
<td>&gt; 4</td>
<td>&lt; 5</td>
<td>9.0 ± 0.5</td>
<td>&gt; 6.7</td>
<td>5.5</td>
</tr>
<tr>
<td>5</td>
<td>&lt; 4</td>
<td>&gt; 5</td>
<td>&lt; 6</td>
<td>9.0 ± 0.5</td>
<td>&gt; 7.8</td>
<td>6.5</td>
</tr>
<tr>
<td>6</td>
<td>&lt; 5</td>
<td>&gt; 6</td>
<td>&lt; 7</td>
<td>9.0 ± 0.5</td>
<td>&gt; 8.9</td>
<td>7.5</td>
</tr>
<tr>
<td>7</td>
<td>&lt; 6</td>
<td>&gt; 7</td>
<td>&lt; 8</td>
<td>9.0 ± 0.5</td>
<td>&gt; 10</td>
<td>8.5</td>
</tr>
<tr>
<td>10</td>
<td>&lt; 9</td>
<td>&gt; 10</td>
<td>&lt; 12</td>
<td>-</td>
<td>&gt; 15.4</td>
<td>13</td>
</tr>
<tr>
<td>11</td>
<td>&lt; 10</td>
<td>&gt; 11</td>
<td>&lt; 13</td>
<td>-</td>
<td>&gt; 16.5</td>
<td>14</td>
</tr>
<tr>
<td>12</td>
<td>&lt; 11</td>
<td>&gt; 12</td>
<td>&lt; 14</td>
<td>-</td>
<td>&gt; 17.6</td>
<td>15</td>
</tr>
<tr>
<td>13</td>
<td>&lt; 12</td>
<td>&gt; 13</td>
<td>&lt; 15</td>
<td>-</td>
<td>&gt; 18.7</td>
<td>16</td>
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<tr>
<td>14</td>
<td>&lt; 13</td>
<td>&gt; 14</td>
<td>&lt; 16</td>
<td>-</td>
<td>&gt; 19.8</td>
<td>17</td>
</tr>
<tr>
<td>15</td>
<td>&lt; 14</td>
<td>&gt; 15</td>
<td>&lt; 17</td>
<td>-</td>
<td>&gt; 20.9</td>
<td>18</td>
</tr>
<tr>
<td>16</td>
<td>&lt; 15</td>
<td>&gt; 16</td>
<td>&lt; 18</td>
<td>-</td>
<td>&gt; 22.0</td>
<td>19</td>
</tr>
<tr>
<td>17</td>
<td>&lt; 16</td>
<td>&gt; 17</td>
<td>&lt; 19</td>
<td>-</td>
<td>&gt; 23.1</td>
<td>20</td>
</tr>
<tr>
<td>18</td>
<td>&lt; 17</td>
<td>&gt; 18</td>
<td>&lt; 20</td>
<td>-</td>
<td>&gt; 24.2</td>
<td>21</td>
</tr>
<tr>
<td>21</td>
<td>&lt; 20</td>
<td>&gt; 21</td>
<td>&lt; 23</td>
<td>-</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>23</td>
<td>&lt; 22</td>
<td>&gt; 23</td>
<td>&lt; 25</td>
<td>-</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

\( P_a \) = Maximum operating pressure in inner pipe (transport pressure + back pressure + pressure due to geodetic height differences)

\( P_{AE} \) = switching level „Alarm ON“, the alarm is triggered at the latest when this level is reached

\( P_{AA} \) = switching level „Alarm OFF“, when this level is exceeded the alarm signal is deleted (\( P_{AA} = P_{AE} + ~250 \text{ mbar with DLR-G 1...7;} \)

\( P_{PRÜF} \) = minimum testing pressure in surveillance space

\( P_{DM} \) = pressure range set in pressure reducing valve (secondary pressure)

1) The pressure control valve UDV1 can be dispensed with if it can be ensured that no pressure increases exceeding the test pressure (e.g. due to warming) can occur in the surveillance space and the pressure to which the pressure reducing valve is set is lower than the test pressure of the surveillance space.

\( P_{PRÜF} \) = pressure set in pressure reducing valve

\( P_{DM} \) = pressure range set in pressure reducing valve (secondary pressure)
## Positive pressure leak detector Type DLR-G ...

### Overview, technical data, construction

<table>
<thead>
<tr>
<th>Application</th>
<th>Leak detector Type DLR-G ...</th>
<th>Leak detector Type DLR-G ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating mode</td>
<td>S – stationary</td>
<td>M – mobile</td>
</tr>
<tr>
<td>Electric connection</td>
<td>leak detector: 230 V, 50 Hz AC</td>
<td>leak detector: 230 V, 50 Hz AC</td>
</tr>
<tr>
<td></td>
<td>distributor block 1, 2</td>
<td>distributor block 1, 2</td>
</tr>
<tr>
<td></td>
<td>potential-free relay contacts „Alarm“</td>
<td>potential-free relay contacts „Alarm“</td>
</tr>
<tr>
<td></td>
<td>230 V, 2 A – distributor block 11, 12</td>
<td>230 V, 2 A – distributor block 11, 12</td>
</tr>
<tr>
<td>Leak detection</td>
<td>nitrogen</td>
<td>nitrogen</td>
</tr>
<tr>
<td>Installation area</td>
<td>Whenever possible, install inside an enclosed, dry room with no access for unauthorized personnel. Installation in areas where there is a danger of explosions is not permitted.</td>
<td>Whenever possible, install inside an enclosed, dry room with no access for unauthorized personnel. Installation in areas where there is a danger of explosions is not permitted.</td>
</tr>
<tr>
<td>Generation of extra pressure</td>
<td>Pressure reservoir (bottle) with pressure reduction</td>
<td>Nitrogen bottle with pressure reduction valve for operation or function test, mobile</td>
</tr>
<tr>
<td>Extra functions</td>
<td>via potential-free relay</td>
<td>via potential-free relay</td>
</tr>
<tr>
<td>Additional criteria</td>
<td>LAZ technically adapted to operating pressure of doublewalled piping</td>
<td>LAZ technically adapted to operating pressure of doublewalled piping</td>
</tr>
<tr>
<td>Housing dimensions</td>
<td>height  width  depth</td>
<td>height  width  depth</td>
</tr>
<tr>
<td></td>
<td>210 mm  265 mm  110 mm</td>
<td>210 mm  265 mm  110 mm</td>
</tr>
<tr>
<td>Fittings</td>
<td>distributor block Type HMB, 2 – 8 connections to double-walled piping</td>
<td>distributor block Type HMB, 2 – 8 connections to double-walled piping</td>
</tr>
<tr>
<td></td>
<td>Insulator Type ET to separate the metal connection in earthed installations acc. to TRbF 521</td>
<td>Insulator Type ET to separate the metal connection in earthed installations acc. to TRbF 521</td>
</tr>
</tbody>
</table>

### Construction Positive pressure leak detector Typ DLR-G ...

![Diagram of leak detector Type DLR-G...](image)

- **B**: LED „Operation“, green
- **A**: LED „Alarm“, red
- **N**: LED „Top-up“, yellow
- **FT**: fill button
- **TA**: switch „acoustic alarm signals”
- **PK**: test coupling
- **VV**: screw connection connection pipe
- **KN**: coupling to top-up feed

### Artikel

<table>
<thead>
<tr>
<th>Artikel</th>
<th>Artikel No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLR-G 1-7 with LOD</td>
<td>829 440 88</td>
</tr>
<tr>
<td>DLR-G 11-18 with LOD</td>
<td>829 440 90</td>
</tr>
<tr>
<td>DLR-G 21 M</td>
<td>829 440 95</td>
</tr>
<tr>
<td>DLR-G 23 M</td>
<td>829 440 97</td>
</tr>
</tbody>
</table>
Positive pressure leak detector Type DLR-G ...

Single-line system – horizontal and vertical laying

The necessary working pressure in the surveillance space is generated and maintained by pressure-regulated topping-up from a stationary nitrogen pressure reservoir continuously connected to the surveillance space (Operating mode S) or a mobile pressure reservoir which is only connected when putting into operation or for function tests (Operating mode M). All permanently installed connections consist of 6 x 1 mm stainless steel piping or 8 x 1 mm PA hose with flanged screw connections. A test valve must be installed at one end of the single-line piping.

The leak detectors must be adjusted to either Operating mode S or M, as well as for the differing transport pressures of the medium pipes.

Laying: underground, surface and combined

Max. monitorable Pipe length L max. sum of all ind. pipe lengths for double-walled piping FLEXWELL® Safety Pipe – all Types: up to 500 m for maximum pipe length > 500 m see Worksheet LDS 8.130 for L max. of individual pipe Types

Operating mode S
- VN screw connection top-up feed
- VV screw connection connection pipe
- DM pressure reducing valve (manufacturer BRUGG)
- FAV cut-off valve bottle
- DS pressure reservoir
- AV connection fitting
- MA measuring branch
- PV test valve
- B LED „Operation“, green
- A LED „Alarm“, red
- N LED „Top-up“, yellow
- FT fill button
- TA switch „acoustic alarm signals“
- PK test coupling
- PM test measuring gauge

Operating mode M
- KN coupling to top-up feed
Positive pressure leak detector Type DLR-G...

Two- and multiple line system – horizontal and vertical laying

The system functions similarly to the single-line system as per Worksheet LDS 8.304. The connection piping 6 x 1 mm stainless steel tubing or 8 x 1 mm PA hose from the leak detector to the double-walled piping are laid either via a distributor block Type HMB as per Worksheet LDS 8.341 or with soldered T-fittings. The distributor block has 1 input and 2 - 8 outlets. The outlets can be closed by means of a stopcock. When it is open, the stopcock must be secured with a seal before being put into operation. A manometer for each outlet shows the pressure of the double-walled piping (stopcock closed) or of the system (stopcock open). A test valve must be installed at each end of the parallel connected piping.

Laying: underground, surface and combined

Max. monitorable Pipe length L max.

<table>
<thead>
<tr>
<th>Sum of all ind. pipe lengths for double-walled piping</th>
<th>FLEXWELL® Safety Pipe – all Types:</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 500 m</td>
<td>for maximum pipe length &gt; 500 m see Worksheet LDS 8.130 for L max. of individual pipe Types</td>
</tr>
</tbody>
</table>

Operating mode S

- VN screw connection top-up feed
- VV screw connection pipe
- DM pressure reducing valve
  (manufacturer BRUGG)
- FAV cut-off valve bottle
- DS pressure reservoir
- AV connection fitting
- MA measuring branch
- PV test valve
- B LED „Operation“, green
- A LED „Alarm“, red
- N LED „Top-up“, yellow
- FT fill button
- TA switch „acoustic alarm signals“
- PK test coupling
- VT distributor block
- PM test measuring gauge

Operating mode M

- KN coupling to top-up feed

for underground piping
Positive pressure leak detector Type DLR-P 2.0

System description

The positive pressure leak detector Type DLR-P 2.0 is suitable for monitoring double-walled piping through which water-hazardous fluids with a flashpoint below and above 55 °C are transported.

Principle of functioning

The necessary positive pressure in the surveillance space of the double-walled piping depends on the actual operating pressure in the medium pipe (inner pipe) and is generated by topping up regulated by pressure changes from a pump unit integrated into the leak detector. A dry filter is connected ahead of the pump, which dries the ambient air drawn in down to 10% relative humidity. The surveillance space is connected with the leak detector DLR-P 2.0 via the connection pipes.

The pressure generated is measured and regulated by means of a pressure-operated switch. After putting the system into operation topping up is regulated by pressure changes. The integrated pump switches in to do this as soon as the pressure in the surveillance space drops somewhat, e.g. due to thermal influences. If the pressure drops to the ALARM ON level, the optical and acoustic alarm signal is triggered.

Technical basis

The alarm is triggered at the latest when a pressure which is at least 1.0 bar over the maximum transport pressure of the medium pipe (inner pipe) is reached. The types of laying are illustrated in Worksheets LDS 8.304 and LDS 8.305.

Tips for installation

The leak detector may not be installed in areas where there is a danger of explosions. Wherever possible, the leak detector should be mounted inside an enclosed dry and frost-free room with no access for unauthorized personnel. If it is installed outside enclosed rooms, the leak detector must be mounted in a weatherproof metal housing.

Installation/commencement of operations/operation/function testing

A detailed description can be seen from the approval documentation of the DLR-P 2.0 leak detector and the Worksheets for the double-walled piping.

Normal operation

The normal operational condition is reached when the system is put into operation after the pressure has built up to the previously set level. The pressure in the surveillance space is monitored in the leak detector via a pressure-operated switch. Any leaks which may occur lead to a pressure drop.

Alarm trigger level: ON < 2.0 bar
Positive pressure leak detector Type DLR-P 2.0
Overview, technical data, construction

<table>
<thead>
<tr>
<th>Application</th>
<th>Positive pressure LD Type DLR-P 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of use</td>
<td>water-hazardous fluids with a flashpoint &gt; 55 °C and &lt; 55 °C</td>
</tr>
<tr>
<td>Electric connection</td>
<td>230 V, 50 Hz AC</td>
</tr>
<tr>
<td></td>
<td>distributor block 2, 3, (1)</td>
</tr>
<tr>
<td></td>
<td>potential-free contacts ALARM</td>
</tr>
<tr>
<td></td>
<td>230 V, 16 A maximum</td>
</tr>
<tr>
<td></td>
<td>distr. block 7, 8</td>
</tr>
<tr>
<td>Installation</td>
<td>Wherever possible, install inside an enclosed, dry room with no access for unauthorized personnel. Installation in areas where there is a danger of explosions</td>
</tr>
<tr>
<td>Extra pressure</td>
<td>integrated pump in leak detector</td>
</tr>
<tr>
<td>Extra</td>
<td>via potential-free relay, contacts 7 + 8</td>
</tr>
<tr>
<td>Additional criteria</td>
<td>leak detector adapted to the operating pressure of double-walled piping</td>
</tr>
<tr>
<td>Housing dimensions</td>
<td>height  width  depth</td>
</tr>
<tr>
<td></td>
<td>320 mm  320 mm  145 mm</td>
</tr>
<tr>
<td>Fittings</td>
<td>distributor block, 2 - 8 connections to double-walled piping.</td>
</tr>
<tr>
<td></td>
<td>Insulator Type ET to separate the metal connection in earthed installations acc. to TRbF 521</td>
</tr>
</tbody>
</table>

Construction positive pressure leak detector Typ DLR-P 2.0
Article No. 701 800 93

B  “Operation”, green
A  “Alarm”, red
TA switch “acoustic alarm”
TF  dry filter
P  shock absorber
Positive pressure leak detector Type DLR-P 2.0
Horizontal laying with a gradient to the tank

Leak detector Type DLR-P 2.0 – pressureless double-walled piping

The necessary positive pressure in the surveillance space is generated by the pump integrated into the leak detector. The monitoring medium is air which is dried down to a relative humidity of 10 % by a dry filter connected ahead of the pump. The drying material (colourless) must be replaced when used up or regenerated (new (orange) drying material).

Max. monitorable pipe length \( L_{\text{max}} \)

\[
\begin{array}{|c|c|c|}
\hline
\text{Type} & \text{DN} (\text{mm}) & \text{L}_{\text{max}} (\text{m}) \\
\hline
\text{SEC 40} & 40 & 950 \\
\text{SEC 50} & 50 & 1450 \\
\text{SEC 100} & 100 & 1450 \\
\hline
\end{array}
\]

Manual flanging tool see Worksheet LDS 8.262.
Fittings for leak monitoring
Insulator, flanged adapter to hose, test valves

**Insulating piece Type ET with flanged screw connection, connections stainless steel**
for connecting 6 x 1 mm stainless steel pipe, to separate the metal connection in earthed installations acc. to TRbF 521.

Article No. 829 339 61

**Insulating piece Type ET with flanged screw connection, connections galvanized steel**
for connecting 8 x 1 mm PA hose to separate the metal connection in earthed installations acc. to TRbF 521.
Two flanged adapters to the hose are needed (not shown here, similar to flanged screw connector with stainless steel connections).

Article No. 829 339 60

**Flanged adapter to hose**
for connecting to 8 x 1 mm PA hose on flanged screw connection.

Flanged adapter – Article No. 989 905 14
PA hose – Article No. 989 905 15

**Test valve Type PV, long**
for connection fitting with split loose flange

**Material**
Steel: Article No. 829 448 90
Stopcock – brass, nickel-plated
Long nipple – galvanized steel, chromated

Stainless steel 1.4571 complete: Article No. 829 448 60

**Test valve Type PV, short**
for connection fitting with external thread or welded end

**Material**
Steel: Article No. 829 448 93
Stopcock – brass, nickel-plated
Nipple – galvanized steel, chromated

Stainless steel 1.4571 complete*: Article No. 829 448 97
Leak monitoring systems

Fittings for leak monitoring

Measuring branch, manual flanging tool

**Measuring branch Type MA, long**
for connection fitting with collar and split loose flange (not shown here)

The connection fitting is shown here with a quarter cut.

**Measuring branch Type MA, short**
for connection fitting with thread or welded end

The connection fitting is shown here with a quarter cut.

Materials and Article Numbers

<table>
<thead>
<tr>
<th>Material</th>
<th>Measuring branch short</th>
<th>Measuring branch long</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galvanized steel</td>
<td>829 333 00</td>
<td>829 331 00</td>
</tr>
<tr>
<td>with PA hose 8 x 1</td>
<td>989 905 15</td>
<td>989 905 15</td>
</tr>
<tr>
<td>and flanged adapter to hose</td>
<td>989 905 14</td>
<td>989 905 14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stainless steel</th>
<th>Measuring branch short</th>
<th>Measuring branch long</th>
</tr>
</thead>
<tbody>
<tr>
<td>with stainless steel pipe 6 x 1</td>
<td>829 339 25</td>
<td>829 339 25</td>
</tr>
</tbody>
</table>

Manual flanging tool with mandrel

Article No. 829 915 10

For flanging 6 x 1 mm stainless steel pipe we offer the tool shown here:

For technical reasons only the BRUGG mandrel 74° may be used for flanging the stainless steel monitoring lead!

The BRUGG mandrel 74° is available as replacement under Article No. 829 915 20.
Fittings for vacuum leak monitoring
Solenoid valve, additional measuring unit ZD 410, detonation guard, distributor block

2/2-way solenoid valve (for VLR 410/E)
needed at operating pressure over 5 bar

Article No. 829 423 94 for 230 V – Worksheet LDS 8.214

Article No. 829 423 96 for 115 V – Worksheet LDS 8.217
Only to be used when laying in multiple lines without distributor block. (on request)

Additional measuring unit ZD 410
Complete, incl. three-way test stopcock
Dimensions (HxWxD): 200x120x100 mm

Article No. 829 421 95

Detonation guard
for installation in explosion-threatened areas

Brass: Article No. 829 424 01
Stainless steel: Article No. 829 423 89

Distributor block Type HM-1B for vacuum

<table>
<thead>
<tr>
<th>Type</th>
<th>Connections</th>
<th>L mm</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 HM-1B</td>
<td>2</td>
<td>80</td>
<td>829 423 80</td>
</tr>
<tr>
<td>3 HM-1B</td>
<td>3</td>
<td>130</td>
<td>829 423 81</td>
</tr>
<tr>
<td>4 HM-1B</td>
<td>4</td>
<td>180</td>
<td>829 423 82</td>
</tr>
<tr>
<td>5 HM-1B</td>
<td>5</td>
<td>230</td>
<td>829 423 83</td>
</tr>
<tr>
<td>6 HM-1B</td>
<td>6</td>
<td>280</td>
<td>829 423 84</td>
</tr>
<tr>
<td>7 HM-1B</td>
<td>7</td>
<td>330</td>
<td>829 423 85</td>
</tr>
<tr>
<td>8 HM-1B</td>
<td>8</td>
<td>380</td>
<td>829 423 86</td>
</tr>
</tbody>
</table>
Fittings for positive pressure leak monitoring

Pressure reducing valve for nitrogen bottle

Type of gas: nitrogen
Primary pressure: 200 bar
Back pressure: 10 / 16 / 20 / 22 bar

<table>
<thead>
<tr>
<th>Type</th>
<th>Back pressure</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM 10</td>
<td>10 bar D</td>
<td>829 443 90</td>
</tr>
<tr>
<td>DM 16</td>
<td>16 bar D</td>
<td>829 443 94</td>
</tr>
<tr>
<td>DM 20</td>
<td>20 bar D</td>
<td>829 443 95</td>
</tr>
<tr>
<td>DM 22</td>
<td>22 bar D</td>
<td>829 443 96</td>
</tr>
<tr>
<td>DM 10 NA</td>
<td>10 bar NL</td>
<td>829 443 97</td>
</tr>
<tr>
<td>DM 10 FA</td>
<td>10 bar F</td>
<td>829 443 92</td>
</tr>
</tbody>
</table>

German connection not marked
NA = Dutch connection
FA = French connection

Nitrogen-steel cylinder Type 12

N₂-F (10 litres) filling pressure 200 bar (without engraving)
Article No. 829 442 70

Wall bracket for nitrogen cylinder Type 12
Article No. 829 442 75

Connection with flare type fitting
for mobile topping-up DLR-G
Article No. 829 441 10

Distributor block Type HMB with flanged screw

Connection Material: brass

The distributor block is available with from 2 up to max. 8 connections.

<table>
<thead>
<tr>
<th>Type</th>
<th>Connections</th>
<th>L (mm)</th>
<th>DLR-G ... with manometer 0 – 16 bar Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 HMB</td>
<td>2</td>
<td>80</td>
<td>829 435 02</td>
</tr>
<tr>
<td>3 HMB</td>
<td>3</td>
<td>130</td>
<td>829 435 03</td>
</tr>
<tr>
<td>4 HMB</td>
<td>4</td>
<td>180</td>
<td>829 435 04</td>
</tr>
<tr>
<td>5 HMB</td>
<td>5</td>
<td>230</td>
<td>829 435 05</td>
</tr>
<tr>
<td>6 HMB</td>
<td>6</td>
<td>280</td>
<td>829 435 06</td>
</tr>
<tr>
<td>7 HMB</td>
<td>7</td>
<td>330</td>
<td>829 435 07</td>
</tr>
<tr>
<td>8 HMB</td>
<td>8</td>
<td>380</td>
<td>829 435 08</td>
</tr>
</tbody>
</table>
Fittings for leak monitoring

Fittings for positive pressure leak detector Type DLR-P 2.0

Distributor block Type HMB with flanged screw connection
Material: brass
The distributor block is available with from 2 up to max. 8 connections.

<table>
<thead>
<tr>
<th>Type</th>
<th>Connections</th>
<th>L (mm)</th>
<th>DLR-P 2.0 with manometer 0–4 bar Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 HMB</td>
<td>2</td>
<td>80</td>
<td>829 435 09</td>
</tr>
<tr>
<td>3 HMB</td>
<td>3</td>
<td>130</td>
<td>829 435 10</td>
</tr>
<tr>
<td>4 HMB</td>
<td>4</td>
<td>180</td>
<td>829 435 11</td>
</tr>
<tr>
<td>5 HMB</td>
<td>5</td>
<td>230</td>
<td>829 435 12</td>
</tr>
<tr>
<td>6 HMB</td>
<td>6</td>
<td>280</td>
<td>829 435 13</td>
</tr>
<tr>
<td>7 HMB</td>
<td>7</td>
<td>330</td>
<td>829 435 14</td>
</tr>
<tr>
<td>8 HMB</td>
<td>8</td>
<td>380</td>
<td>829 435 15</td>
</tr>
</tbody>
</table>

Distributor block Type HMQV with quick-screw connection
Material: brass
The distributor block is available with from 2 up to max. 8 connections.

<table>
<thead>
<tr>
<th>Type</th>
<th>Connections</th>
<th>L (mm)</th>
<th>DLR-P 2.0 with manometer 0–4 bar Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 HMQV</td>
<td>2</td>
<td>80</td>
<td>829 435 19</td>
</tr>
<tr>
<td>3 HMQV</td>
<td>3</td>
<td>130</td>
<td>829 435 20</td>
</tr>
<tr>
<td>4 HMQV</td>
<td>4</td>
<td>180</td>
<td>829 435 21</td>
</tr>
<tr>
<td>5 HMQV</td>
<td>5</td>
<td>230</td>
<td>829 435 22</td>
</tr>
<tr>
<td>6 HMQV</td>
<td>6</td>
<td>280</td>
<td>829 435 23</td>
</tr>
<tr>
<td>7 HMQV</td>
<td>7</td>
<td>330</td>
<td>829 435 24</td>
</tr>
<tr>
<td>8 HMQV</td>
<td>8</td>
<td>380</td>
<td>829 435 25</td>
</tr>
</tbody>
</table>

Dry filter TF1
incl. drying agent and holder
Article No. 701 800 92

Fittings for SECON®-X monitoring sleeve

Connection leak detector
Article No. 989 905 10

Schrader valve to hose
Article No. 989 905 11

Schrader valve adapter to flange
Article No. 989 905 12

Test valve for Schrader valve connection
Article No. 989 905 13
Leak monitoring systems

Leak monitoring: Checking the plant

Procedure

Test requirements

The basic safety technical requirements are set out in the Technical Rules for flammable Fluids - TRbF/TRBS. The legal provisions governing water usage are governed by the German Water Resources Act (Wasserhaushaltsgesetz – WHG) and the ordinance dealing with plants which handle water-hazardous substances - VAwS – as well as the regulations implementing the VAwS.

Standard procedures for testing TRbF 620 8 (technical rules for flammable fluids)

Standard procedures for tanks and piping
Section 1.23 Double-walled piping

(1) No. 1.21 applies. Connections (see Number 1.21, Par. 5) do not need to be exposed for the pressure test however.

(2) In as far as no connections to the double-walled piping are made on site, the construction and pressure test by the technical expert can be dispensed with.

(3) The test pressure for the test on the surveillance space depends on that given in the approval for the leak detector. A pressure test of the inner pipe is not necessary if the test pressure for the surveillance space is at least that for the inner pipe and a certificate from an expert firm can be provided for the construction and pressure test of the inner pipe.

Tightness test

The double-walled piping is prefabricated and tested at the factory. If piping configured and put together ex works is used, Pos. (2) applies. If the pipes are laid in one piece, as is the general rule, the tightness of the connection fittings installed on site must be tested with test pressure in the surveillance space.

The level of test pressure depends on the leak detector which is connected and in the case of

- a vacuum leak detector is max. operational piping pressure x 1.3, but at least 5 bar
- with a positive pressure leak detector max. monitoring pressure in the surveillance space x 1.3, but at least 5 bar.

The construction of the connection fittings, their material and joining methods are a system component of the approval. They comply with the most recent regulations. The pressure test of the inner pipe is not necessary since the double-walled piping has already undergone a tightness test at the factory.

Acceptance test, repeat testing

The acceptance test or the repeat tests are dealt with in Section 2 of the TRbF 620. According to this, the tightness test for the double-walled piping with a leak detector is replaced by a function test of the leak detector equipment.

The test intervals are set out in the VAwS. Repeat tests are to be carried out after 5 years (in protected areas after 2.5 years).

§§ 62/63 WHG also refers to the need to comply with the legislation of the Federal State involved. In the regulations for plants - VAwS -, here, e.g. in Bavaria, it stands in Par. 18.1 of the VAwS that leak detectors must be subjected to a function test at least once a year. The function test is to be carried out by specialist personnel or by an accredited expert firm.
Leak monitoring systems

Leak monitoring: Checking the plant

Procedure

Testing the leak monitoring system

After it has been installed and put into operation as well as following maintenance work, a check must be made on the leak monitoring system/leak detector to ascertain whether it functions as foreseen and safely. The check must also include a test of free passage in the suction or positive pressure tubing and in the measuring lead between leak detector and surveillance space as well as the test valves. The complete plant (surveillance space with connection pipes and leak detector) must be tested for tightness by connecting a measuring device with an accuracy of at least Class 1.6 to the test sockets of the leak detector.

The operating and functional safety of the leak detector in its mechanical-pneumatic and electrical part must be determined by measuring the switching values of the vacuum or positive pressure switch and by checking the transport level of the regulating pump set out in the documentation of the leak detector. The pressure rise or drop in the surveillance space are to be measured via the test fitting on the leak detector. In this way the free passage test of connection pipes (suction or positive pressure tubing and the measuring lead) is also given. The triggering of the optical and acoustic alarm signals by the leak detectors must also be determined.

The fittings and accessory components necessary and prescribed for the operation of the leak monitoring device (e.g. dry filter, fluid barriers, condensate containers) are also to be tested for functional and operational safety.

A tests report must be drawn up on the test of the leak monitoring device.

The further Worksheets give details of the systematic checking procedures for the systems of the various leak monitoring devices.

Double-walled piping with vacuum leak detector
Double-walled piping with positive pressure leak detector

Any defects in the leak monitoring system which cannot be rectified during the check must be mentioned in the test report. The plant operator must be explicitly informed of such findings. The plant operator shall receive a copy of the test report, another goes to the specialist firm and is kept there.

The manufacturer of the leak detector prescribes a maintenance check of the leak detector repeated every year by a specialist firm acc. to §§ 62/63 WHG in order to ensure functional and operational safety.
Leak monitoring: Checking the plant

Vacuum leak detector Type VLR 410/E and VLX 330/A-Ex – General information

Project:

Contact person:

Telephone: ____________________________ eMail: ____________________________

Leak detector Type: ✔️ VLR 410/E ✔️ VLX 330/A-Ex

Double-walled piping Type: ____________________________

No. of piping lines: ____________________________ overall length: ____________________________ m

Surveillance space volume: ____________________________ m³

Transport medium:

Operating pressure:

Device under seal: yes ✔️ no

Positions when checking the plant – Checklist see Worksheet LDS 8.273
### Leak monitoring: Checking the plant

Vacuum leak detector Type VLR 410/E and VLX 330/A-Ex – Checking the plant

<table>
<thead>
<tr>
<th>Pos No.</th>
<th>of component to be checked</th>
<th>functions well</th>
<th>defective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vacuum pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Vacuum switch Switching levels: VLR 410/E / VLX 330/A-Ex</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>pump „off“  &lt; 540 mbar / &lt; 540 mbar</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>pump „on“ the level must be at least 15 mbar higher than the switching level measured for „Alarm „on“</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alarm „on“  &gt; 410 mbar / &gt; 330 mbar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Filter with non-return valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Screw connections: ventilation screw and three-way stopcock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Screw connections underneath the leak detector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Screw connections: fluid barriers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>T-piece in the connection pipes – single-line system – *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/9</td>
<td>All screw connections: long nipple/test valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>All screw connections: measuring branch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Pressure test of individual lines: surveillance space</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**When piping is untight**

| 12      | Screw socket, inner weld seams / GRAPA                                                   |                |           |
| 13      | Screw socket, outer weld seams / GRAPA                                                   |                |           |
| 14      | Screw socket, all fitting drill holes                                                    |                |           |

**Put into operation**

<table>
<thead>
<tr>
<th>yes</th>
<th>no</th>
</tr>
</thead>
<tbody>
<tr>
<td>surveillance space – clear passag</td>
<td></td>
</tr>
<tr>
<td>existing defects rectified</td>
<td></td>
</tr>
<tr>
<td>Plant put into operation</td>
<td></td>
</tr>
<tr>
<td>Vacuum leak detector under seal</td>
<td></td>
</tr>
</tbody>
</table>

* also in multiple-line system with distributor block
# Leak monitoring: Checking the plant

Vacuum leak detector Type VLR 410/E and VLX 330/A-Ex – Test report

<table>
<thead>
<tr>
<th>Operator:</th>
<th>Project:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Test date:</th>
<th>Tester:</th>
<th>Telephone:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. First commissioned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. annual check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. after fault repair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLEXWELL® Safety Pipe Type:</th>
<th>STAMANT Type:</th>
<th>SECON®-X Type:</th>
<th>Transport medium:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pipe length m:</th>
<th>No. lines:</th>
<th>Laying:</th>
<th>horizontal</th>
<th>vertical</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type leak detector:</th>
<th>No. of device:</th>
<th>built (year):</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1. Test of vacuum switch</th>
<th>pump off:</th>
<th>mbar</th>
</tr>
</thead>
<tbody>
<tr>
<td>pump on:</td>
<td>mbar</td>
<td>Alarm on:</td>
</tr>
</tbody>
</table>

(Correct levels: pump off: < 540 mbar / pump on: > 425 mbar / Alarm on: > 410 mbar)

pump on: at least 15 mbar higher than level measured for Alarm on

<table>
<thead>
<tr>
<th>2. Pumping head of vacuum pump:</th>
<th>mbar</th>
</tr>
</thead>
</table>

Pumping head sufficient: yes | no | repaired |

<table>
<thead>
<tr>
<th>3. Tightness of leak detector determined*:</th>
<th>yes</th>
<th>no</th>
<th>repaired</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>4. Connection pipes – kinks and crimping:</th>
<th>yes</th>
<th>no</th>
<th>repaired</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5. Clear passage through suction pipe:</th>
<th>yes</th>
<th>no</th>
<th>repaired</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>6. Clear passage through measuring lead:</th>
<th>yes</th>
<th>no</th>
<th>repaired</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>7. Clear passage through measuring lead:</th>
<th>yes</th>
<th>no</th>
<th>repaired</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>8. Tightness of leak detector determined*:</th>
<th>yes</th>
<th>no</th>
<th>repaired</th>
</tr>
</thead>
</table>

Laying with ZD – function OK (Alarm triggered latest at 410 mbar): yes | no | repaired |

Control cable ZD connected to leak detector: yes | no | repaired |

Vertical laying with solenoid valve – function OK: yes | no | repaired |

Permanent power supply connection, non-detachable: yes | no | repaired |

Alarm of leak detector OK: yes | no | repaired |

Leak detector system functional and operationally safe: yes | no | |

<table>
<thead>
<tr>
<th>9. Leak detector system as per approval:</th>
<th>yes</th>
<th>no</th>
<th></th>
</tr>
</thead>
</table>

Remarks:

Date: Signature of expert: Company stamp:

* see Page 18, leak detector documentation VLR (must be with device)
Leak monitoring: Checking the plant
Positive pressure leak detector Type DLR-G ... and DLR-P 2.0 – General information

Details of procedure for checking the plant Leak monitoring
see Worksheets LDS 8.270 and LDS 8.271

Project: ____________________________________________________________
Contact person: ____________________________________________________
Telephone: __________________________ eMail: ________________________
Double-walled piping Type: __________________________________________
No. of lines: __________________________ Overall length: _____________ m
Surveillance space volume: _____________ m³
Substance transported: ________________________________________________
Operating pressure: _________________________________________________
Device under seal: yes [ ] no [ ]

Positions when checking the plant – Checklist see Worksheet LDS 8.363

Leak detector
DLR-P 2.0 [ ]
DLR-G _____ stationär [ ] mobil [ ]

5 / 7
1 / 2 / 3
17
6
10
11
13
14
12
8
10
13
14
9
5 / 7 / 15 / 16
6
17
11
13
12
14
8
10
11
13
9
5 / 7

Subject to technical changes.
# Leak monitoring: Checking the plant

Positive pressure leak detector Type DLR-G ... and DLR-P 2.0 – Checking the plant

<table>
<thead>
<tr>
<th>Pos. No.</th>
<th>Component to be checked</th>
<th>tight/ functions well</th>
<th>untight/ defective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N₂ bottle valve: spindle/thread</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2</td>
<td>N₂ pressure reducing valve: check if BRUGG type! If from another manufacturer: replace it!</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3</td>
<td>N₂-Druckminderer: Verschraubungen</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5</td>
<td>Safety valve</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6</td>
<td>Screw connections: manometer</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>7</td>
<td>All connections: in leak detector</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>8/9</td>
<td>All screw connections: test valves</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>10</td>
<td>All screw connections: measuring branches</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>11</td>
<td>Pressure tests of ind. lines: surveillance space</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

When piping is untight

| 12       | Screw socket, inner weld seams / GRAPA | □                     | □                 |
| 13       | Screw socket, outer weld seams / GRAPA | □                     | □                 |
| 14       | Screw socket, all fitting drill holes | □                     | □                 |
| 15       | Positive pressure pump (only DLR-P 2.0) | □                     | □                 |
| 16       | Positive pressure switch, switching levels (only DLR-P 2.0) | □                     | □                 |
|          | pump „off“ < 1450 mbar                  | □                     | □                 |
|          | pump „on“ > 1350 mbar                   | □                     | □                 |
|          | Alarm „on“ > 1100 mbar                  | □                     | □                 |
| 17       | Dry filter (only DLR-P 2.0)             | □                     | □                 |

Put into operation

<table>
<thead>
<tr>
<th>yes</th>
<th>no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveillance space has clear passage</td>
<td>□</td>
</tr>
<tr>
<td>Existing defects rectified</td>
<td>□</td>
</tr>
<tr>
<td>Plant put into operation</td>
<td>□</td>
</tr>
<tr>
<td>Positive pressure leak detector under seal</td>
<td>□</td>
</tr>
</tbody>
</table>

Stamp/ Date: ____________________ Signature: ____________________
Leak monitoring: Checking the plant
Positive pressure leak detector Type DLR-G ... and DLR-P 2.0 – Test report

Operator:  
Test date:  
Tester:  
Telephone:  
Project:  

1. First commissioned  
2. Annual check  
3. After fault repair  
4. other  

FLEXWELL® Safety Pipe Type:  
STAMANT Type:  
SECON®-X Type:  
Transport medium:  

Pipe length m:  
No. of lines:  
Laying:  
underground  
surface  

Type leak detector:: DLR-G  
Operating mode: stationary  
mobile  
DLR-P 2.0  
Device no.:  
Built (year):  

Switching levels measured:

<table>
<thead>
<tr>
<th>Correct levels</th>
<th>P_{PA}</th>
<th>P_{PMA}</th>
<th>P_{PDM}</th>
<th>Correct levels</th>
<th>P_{PA}</th>
<th>P_{PMA}</th>
<th>P_{PDM}</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLR-G 1</td>
<td>&gt; 1</td>
<td>&lt; 2</td>
<td>&gt; 12</td>
<td>DLR-G 12</td>
<td>&gt; 13</td>
<td>&lt; 14</td>
<td>15</td>
</tr>
<tr>
<td>DLR-G 2</td>
<td>&gt; 2</td>
<td>&lt; 3</td>
<td>&gt; 13</td>
<td>DLR-G 13</td>
<td>&gt; 15</td>
<td>&lt; 18</td>
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Tightness of leak detector determined: pressure drop bar in 120 min.  
yes  
no  
repaired  

Connection pipe – kinks and crimping:  
yes  
no  
repaired  

Clear passage through connection pipe:  
yes  
no  
repaired  

Tightness of leak detector determined: pressure drop bar in 120 min.  
yes  
no  
repaired  

Potential-free outlet (clamp 11/12) – Function OK:  
yes  
no  
repaired  

Permanent power supply connection, non-detachable:  
yes  
no  
repaired  

Alarm of leak detector OK:  
yes  
no  
repaired  

Leak detector system functional and operationally safe:  
yes  
no  

Leak detector system as per approval:  
yes  
no  

Remarks:  

Date:  
Signature of expert:  
Company stamp:
Locating the leak inner and outer pipe

Procedure

Leak monitoring

Flammable or water-hazardous fluids are transported through the inner medium pipe of a double-walled pipe system. The outer containment pipe prevents uncontrolled spillage of the dangerous transport medium if leaks occur. Approved leak detectors can be connected to the surveillance space between the inner and outer pipes for permanent leak monitoring on the vacuum or positive pressure principle. The leak detectors regulate the monitoring pressure in the surveillance space of the double-walled safety pipe and register any pressure changes when either the inner or outer pipe is damaged. When damage occurs, the leak detector gives an acoustic or optical alarm signal which can be transmitted over long distances via potential-free relay contacts.

Locating the leak

If the alarm is given, first of all a check should be carried out on all easily accessible and visible parts of the piping such as the leak detector, connection pipes and test valves at the end connections. The next step is to examine the weld or solder seams of the visible connection fittings (inner /outer pipe).

If the leak has still not been found, the piping itself needs to be checked. It is recommended for this to detach all connections to further piping above ground, to install blank flanges at both ends and to mount a manometer for the inner pipe at one end. After that, the surveillance space should be pressurized and checked to see whether the pressure leaks out into the inner pipe or into the environment.

The leak detector and the connection pipes

Untightness in the leak detector or in the connection pipes can as a rule be easily detected by means of a pressure test and spraying on bubble-forming fluid.

Leaks in the outer pipe

If the outer pipe is damaged it is recommended to check whether earth-moving work has been carried out along the piping route. The great majority of outer pipe damage is caused by mechanical impact from outside (e.g. by mechanical excavators). For this reason it makes sense to check for damage to the outer pipes first in such areas.

If the leak cannot be found in this way, the surveillance space between inner and outer pipe can be can be filled with a readily volatile gas, e.g. helium, to locate the leak. The gas escapes through the leak and rises to the surface, where it can be detected by using a gas detector. If the pipe route runs underneath a concrete or asphalt surface, holes can be drilled for this at intervals of 1 m to 2 m.

Leaks in the inner pipe

One of the options for locating a leak in the inner pipe is via the ultrasonic method. In this, the surveillance space is filled with nitrogen. The nitrogen enters the inner pipe through the leak, causing a flow noise. An ultrasound sensor which is pulled slowly through the inner pipe registers this noise and reports it to a display unit. By reading off the metre indication on the pulling wire of the sensor, it can then be determined how far along the pipe from the end the leak is located.
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Brugg Rohrsystem AG
Industriestrasse 39
CH-5314 Kleindöttingen
phone +41 (0)56 268 78 78
fax +41 (0)56 268 78 79
pipesystems@brugg.com
www.pipesystems.com

BRUGG Rohrsysteme GmbH
Adolf-Oesterheld-Straße 31
D-31515 Wunstorf
phone +49 (0)50 31 170-0
fax +49 (0)50 31 170-170
info.brg@brugg.com
www.brugg.de

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